AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

1-92. (Canceled)

93. (New) A method of simultaneously conducting multiple chemical reactions in a reaction assembly that comprises a microtiter plate of wells containing test samples and an array of sets of chemical reactants comprising the steps of: assembling the array of sets of chemical reactants to the microtiter plate of test samples such that the array covers open ends in the test sample wells of the microtiter plate to form a plurality of closed cells, each closed cell comprising a set of chemical reactants and a respective test sample; sealing the microtiter plate to the array to create one or more of a gas tight, a liquid tight, and a fluid tight seal; and mechanically agitating the sealed reaction assembly to contact the test samples with the chemical reactants in each closed cell simultaneously.

94. (New) The method of claim 93, wherein the step of assembling comprises the step of placing a pliable gasket between the microtiter plate and the array, the gasket having an arrangement of through holes that align with the test sample wells and the sets of chemical reactants; and the step of sealing comprises the step of applying one or more of mechanical clamps, radiation, heat, external fluid pressure, vacuum and an adhesive to the reaction assembly.

95. (New) The method of claim 94, wherein the gasket further comprises an adhesive on at least one gasket surface that interfaces with the microtiter plate or the array, and wherein the step of sealing further comprises removing the one or more of mechanical clamps, radiation, heat, external fluid pressure, and vacuum after a period of time.

96. (New) The method of claim 95, wherein the adhesive is selected from an ultraviolet (UV) light curable adhesive that has increased adhesion with the application of UV light to the adhesive, and a releasable adhesive that has reduced adhesion with the application of one or more of heat, cold and radiation to the adhesive.

97. (New) The method of claim 94, wherein in the step of placing the gasket, the gasket further has at least one channel that interconnects at least two through holes, such that in the step of assembling, the reaction assembly has at least two closed cells that are interconnected, and wherein in the step of mechanically agitating, the agitation has an acceleration, and the step of mechanically agitating comprises the step of incrementally increasing the acceleration to sequentially mix the test samples of the interconnected closed cells.

98. (New) The method of claim 97, wherein the interconnected closed cells are located adjacent to each other.

99. (New) The method of claim 93, wherein in the step of assembling, the array is made of a flexible material, and wherein in the step of sealing, the array is placed against the microtiter plate using one or more of mechanical clamps, radiation, heat, external fluid pressure, vacuum and an adhesive to seal the reaction assembly.

100. (New) The method of claim 93, wherein in the step of assembling, the array is made of an optically transparent flexible film having an adhesive surface that surrounds the sets of chemical reactants, the adhesive surface being contacted with the microtiter plate.

101. (New) The method of claim 93, wherein in the step of assembling, the array is made of a flexible material having an adhesive on a surface that comprises the sets of chemical reactants, and the adhesive surface is contacted with the microtiter plate, and wherein the step of sealing comprises applying one or more of mechanical clamps, radiation, heat, external fluid pressure, and vacuum to the reaction assembly for a period of time until the adhesive adheres the array to the plate.

102. (New) The method of claim 101, wherein the adhesive is selected from an ultraviolet (UV) light curable adhesive that has increased adhesion with the application of UV light to the adhesive, and a releasable adhesive that has reduced adhesion with the application of one or more of heat, cold and radiation to the adhesive.

103. (New) The method of claim 93, wherein the test sample wells are spatially arranged in a surface of the microtiter plate, each well having a side wall adjacent to a closed end that together enclose the well except for an open end at the surface of the microtiter plate, and wherein the array comprises an array substrate having the sets of chemical reactants bound to an array surface of the array substrate in an array pattern of features, the array pattern being similar to the spatial arrangement of test sample wells on the microtiter plate.

104. (New) The method of claim 93, wherein in the step of mechanically agitating, a difference in mass densities between the test sample and gas filling any space between the test sample and the set of chemical reactants in each closed cell causes mixing of the test sample with the chemical reactants in each closed cell.

105. (New) The method of claim 93, further comprising the step of analyzing reaction products in the closed cells after the step of mechanically agitating.

106. (New) The method of claim 105, wherein one or both of the microtiter plate and the array is optically transparent.

107. (New) The method of claim 93, further comprising the step of analyzing reaction products after the step of mechanically agitating comprising the steps of: disassembling the reaction assembly; rinsing the array; and interrogating the array.

108. (New) The method of claim 93, wherein the microtiter plate is selected from a 96, 234, 384, and 1536 well microtiter plate and the number of sets of chemical reactants on the array match the selected microtiter plate.

109. (New) The method of claim 93, wherein each set of chemical reactants is an array feature that comprises a subarray having the chemical reactants arranged in a subarray pattern of subfeatures, and wherein the chemical reactant is different in at least one feature or in at least one subfeature on the array.

110. (New) The method of claim 93, wherein the test sample is different in at least one well of the microtiter plate.

111. (New) A method of simultaneously conducting multiple chemical reactions between a first chemical sample and a second chemical sample comprising the steps of: providing a plate having a plurality of wells spatially arranged in a surface of the plate in a well array pattern, each well having a side wall adjacent to a closed end that enclose the well except for an open end that is opposite the closed end and that is adjacent to the plate surface, the plurality of wells for receiving the first chemical sample via the open end; providing an array of the second chemical sample, the array comprising sets of the second chemical sample bound to and spatially arranged on a surface of an array substrate in an array pattern of features, the well array pattern being spatially similar to the

feature array pattern; assembling the array onto the plate to form a sealed reaction assembly, such that the surface of the array faces the surface of the plate and encloses the open ends of the plurality of wells to form closed cells, each closed cell comprising the first chemical sample and a respective set of the second chemical sample features, wherein the sealed reaction assembly is one or more of gas tight, liquid tight, and fluid tight; and contacting the first chemical sample with the second chemical sample in each closed cell of the sealed reaction assembly.

112. (New) The method of claim 111, wherein the array substrate is made of a flexible material, and wherein in the step of assembling, the array substrate is contacted with the plate using one or more of mechanical clamps, radiation, heat, external fluid pressure, vacuum and an adhesive to seal the reaction assembly.

113. (New) The method of claim 111, wherein the array substrate is made of an optically transparent flexible film having an adhesive on the surface to which the second chemical samples are bound, the adhesive surrounding the features, and wherein in the step of assembling, the adhesive is contacted with the plate surface to seal the reaction assembly.

114. (New) The method of claim 112, wherein the flexible array substrate further comprises the adhesive on the surface to which the second chemical samples are bound, and wherein in the step of assembling, the adhesive surface of the array is contacted with the plate surface, and the reaction assembly is sealed using one or more of heat, radiation, and pressure.

115. (New) The method of claim 114, wherein the adhesive is selected from a releasable adhesive, such that adhesion is reduced with the application of heat, cold or radiation to the adhesive, and an ultraviolet light (UV) curable adhesive, such that adhesion is increased with the application of UV light to the adhesive.

116. (New) The method of claim 111, wherein the plate further comprises a pliable gasket material integral with the surface of the plate, the gasket comprising a plurality of through holes spatially arranged through a thickness of the gasket material to correspond with arrangement of the plurality of wells, and wherein in the step of assembling, the surface of the array is contacted with the integral gasket with one or more of mechanical clamps, radiation, heat, external fluid pressure, vacuum and an adhesive to seal the reaction assembly.

117. (New) The method of claim 116, wherein the integral gasket further has at least one channel that interconnects at least two through holes, such that in the step of assembling, the reaction assembly has at least two closed cells that are interconnected, and wherein in the step of contacting, the first chemical samples in the interconnected closed cells mix with each other and with the second chemical samples in each interconnected closed cell via the channel.

118. (New) The method of claim 111, further comprising the step of providing a gasket having a plurality of through holes spatially arranged through a thickness of the gasket in a through hole array pattern, wherein the well pattern, the array pattern and the through hole pattern are dimensionally and spatially similar, the gasket being made of a pliable material, and wherein the step of assembling comprises placing the pliable gasket between the plate surface and the array surface, such that the plurality of through holes are aligned with the features of the second chemical sample and the wells, and sealing the gasket to the array and the plate using one or more of mechanical clamps, radiation, heat, external fluid pressure, vacuum and an adhesive to seal the reaction assembly.

119. (New) The method of claim 118, wherein the pliable gasket comprises the adhesive on at least one surface adjacent either the plate surface or the array surface.

120. (New) The method of claim 119, wherein the adhesive is selected from a releasable adhesive, such that adhesion is reduced with the application of heat, cold or radiation to the adhesive, and an ultraviolet light (UV) curable adhesive, such that adhesion is increased with the application of UV light to the adhesive.

121. (New) The method of claim 118, wherein in the step of providing the gasket, the gasket further has at least one channel that interconnects at least two through holes, such that in the step of assembling, the reaction assembly has at least two closed cells that are interconnected, and wherein in the step of contacting, the first chemical samples in the interconnected closed cells mix with each other and with the second chemical samples in each interconnected closed cell via the channel.

122. (New) The method of claim 111, wherein the step of contacting comprises one or more of mechanically agitating the reaction assembly, controlling the reaction temperature of the reaction assembly, directing radiation into the assembly, and inverting the reaction assembly to cause mixing between the first chemical sample and the second chemical sample.

123. (New) The method of claim 111, before the step of assembling, further comprising the steps of: providing a gasket having a plurality of spatially arranged through holes, the arrangement of through holes being similar to the arrangement of the wells and of the array pattern, the gasket being made of a pliable material; and introducing an aliquot of the first chemical sample into each well of the plate, the first chemical samples being fluid and partially filling the wells, and introducing a volume of a second fluid to the wells, the second fluid having a mass density that is different from a mass density of the first chemical sample and the second fluid being non-reactive with the first chemical sample and second chemical sample, wherein the step of assembling comprises the steps of: placing the gasket on the surface of the plate, placing the array on the gasket, such that the array

features are aligned with the through holes and the wells, and sealing the plate, the gasket and the array together using one or more of mechanical clamps, radiation, heat, external fluid pressure, vacuum and an adhesive, and wherein the step of contacting comprises mechanically agitating the reaction assembly to mix the first chemical sample and the second chemical sample in each closed reaction cell.

124. (New) The method of claim 123, wherein in the step of mechanically agitating, the difference in the mass densities of the first chemical sample and the second fluid causes mixing of the first chemical sample with the second chemical sample in each closed cell.

125. (New) The method of claim 123, wherein in the step of providing the gasket, the gasket further has at least one channel that interconnects at least two through holes, such that in the step of assembling, the reaction assembly has at least two closed cells that are interconnected, and wherein in the step of mechanically agitating, the agitation has an acceleration, and the step of mechanically agitating comprises incrementally increasing the acceleration in magnitude to sequentially mix the first chemical samples of the interconnected closed cells.

126. (New) The method of claim 125, wherein the interconnected closed cells are located adjacent to each other.

127. (New) The method of claim 123, wherein the gasket further comprises the adhesive on surfaces that interface with the plate and the array, and wherein the step of sealing further comprises removing the one or more of mechanical clamps, radiation, heat, external fluid pressure, and vacuum after a period of time.

128. (New) The method of claim 127, wherein the gasket is made of a flexible adhesive film.

129. (New) An apparatus for simultaneously conducting multiple chemical reactions comprising: a plate having a plurality of wells spatially arranged in a surface of the plate in a well array pattern, each well having a side wall adjacent to a closed end that enclose the well except for an open end that is opposite the closed end and that is adjacent to the plate surface, the plurality of wells for receiving a test sample via the open end; an array of sets of chemical reactants, the sets of chemical reactants being bound to and spatially arranged on a surface of an array substrate in an array pattern of features, the well array pattern being spatially similar to the feature array pattern, wherein the array surface faces the plate surface and covers the open ends of the wells to form closed cells, each closed cell comprising a respective test sample and a respective set of the chemical reactants; and a seal between the plate and the array that is one or more of gas tight, liquid tight, and fluid tight.

130. (New) The apparatus of claim 129, wherein the seal comprises a pliable gasket and one or more of mechanical clamps, radiation, heat, external fluid pressure, vacuum and an adhesive, the gasket having a plurality of through holes spatially arranged through a thickness of the gasket in a through hole pattern that is dimensionally and spatially similar to the well pattern and the array pattern.

131. (New) The apparatus of claim 130, wherein the pliable gasket is a flexible adhesive film.

132. (New) The apparatus of claim 130, wherein the pliable gasket further has at least one channel that interconnects at least two through holes, such that the respective test samples in the interconnected closed cells can be mixed via the channel.

133. (New) The apparatus of claim 130, wherein the pliable gasket is integral with the surface of the plate.

134. (New) The apparatus of claim 129, wherein the seal comprises the array substrate being made of a flexible material and one or more of mechanical clamps, radiation, heat, external fluid pressure, vacuum and an adhesive.

135. (New) The apparatus of claim 129, wherein the seal comprises the array substrate being made of an optically transparent flexible film having an adhesive that surrounds the features on the array surface, the adhesive being contacted with the plate surface.

136. (New) The apparatus of claim 129, wherein the seal comprises using an adhesive selected from a releasable adhesive, such that adhesion is reduced with the application of heat, cold or radiation to the adhesive, and an ultraviolet light curable adhesive, such that adhesion is increased with the application of ultraviolet light to the adhesive.

137. (New) The apparatus of claim 136, wherein the releasable adhesive is an ultraviolet light-releasable adhesive.

138. (New) The apparatus of claim 133, wherein in the plate is a microtiter plate selected from a 96, 234, 384, and 1536 well plate, and wherein the array has the array pattern that matches the selected microtiter plate.

139. (New) A kit for simultaneously conducting multiple different assays of biological materials comprising: an array having a plurality of sets of chemical reactants spatially arranged on an array substrate; and a plate having a plurality of spatially arranged wells in the plate, the wells being closed at one end and open at an opposite end for receiving a sample under test, wherein the array and the plate form a multiple closed cell reaction assembly when the array is assembled to the plate, such that the array covers the open ends of the wells to form closed cells, each closed cell comprising the test sample and a respective set of the chemical reactants, the reaction assembly

comprising a seal between the plate and the array that is one or more of gas tight, liquid tight, and fluid tight when assembled.

140. (New) The kit of claim 139, further comprising one or more of: a pliable gasket having a plurality of spatially arranged through holes similar to the spatial arrangement of the wells and the sets of reactants, the pliable gasket providing the seal between the plate and the array when combined with one or more of mechanical clamps, radiation, heat, external fluid pressure, vacuum and an adhesive; an adhesive for sealing at least the array and the plate; a sample biological material for a control experiment; instructions for simultaneously conducting multiple reactions; and instructions for assembling the array to the plate.